

Micro Motion® Model 5700 Transmitter

Measuring Instruments Directive (MID) Applications Supplement



MICRO MOTION™

Safety messages

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

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Contents

Chapter 1	MID applications	1
Chapter 2	Certification	2
Chapter 3	MID flow computer	5
Chapter 4	MID power supply requirements	6
Chapter 5	MID unsecured and secured modes	7
Chapter 6	MID feature interactions	8
	6.1 Clearing rollovers	11
Chapter 7	Read revision and checksum data	12
	7.1 Read revision and checksum data using the display	12
	7.2 Read revision and checksum data using ProLink III	13
	7.3 Read revision and checksum data using a Modbus Digital Communications host	14
Chapter 8	Secure the meter	15
Chapter 9	Switch to unsecured mode	18

1 MID applications

The Measuring Instruments Directive (MID) is a European Union directive (2004/22/EC up to April 20, 2016; 2014/32/EU from April 20, 2016) that standardizes 10 types of measuring instruments. Companies can use the Model 5700 transmitter as an essential part in measuring systems for the continuous and dynamic measurement of liquid quantities other than (clean drinking) water (Annex VII, MI-005) or as a gas meter in fuel gas applications (Annex IV, MI-002).

Model 5700 connections

Liquid measuring system connections	The Model 5700 transmitter connects to Micro Motion sensors that are described in and covered by the Evaluation certificates TC7050 (F-series) and TC7056 (CMF-series).
Gas meter connections	The Model 5700 transmitter connects to Micro Motion sensors that are described in and covered by MID EC/EU Type Examination certificate T10020.

Model 5700 output signals

The approved Model 5700 transmitter output signals are:

- Dual pulse, phase shifted, frequency output signal — represents mass flow or volume flow
- 4-20 mA — represents density
- RS485 Modbus — represents the various parameters (for example, mass total) to an approved-indicating device or flow computer
- Any Model 5700 interface will display mass total/inventory or volume total/inventory

When a Model 5700 transmitter is MID-approved, the MID-approved Process Variables (PVs) on the display are provided with a top banner that states, **LEGAL FOR TRADE.**

Model 5700 input signals

- 4-20 mA temperature signal from an approved external temperature transmitter — for example, Rosemount 3144P with Parts Certificate TC7458
- 4-20 mA pressure signal from an approved external pressure transmitter — for example, Rosemount 3051S with Parts Certificate TC7457
- RS485 Modbus from a remote Core Processor — for example, MVD700 or MVD800 with Evaluation certificate TC7057
- RS485 Modbus to a Modbus Digital Communication host
- HART Bell 202 over the first current output for reading digitally the pressure and/or temperature from an approved external transmitter

The HART signal is superimposed on the DC current of the output.

2 Certification

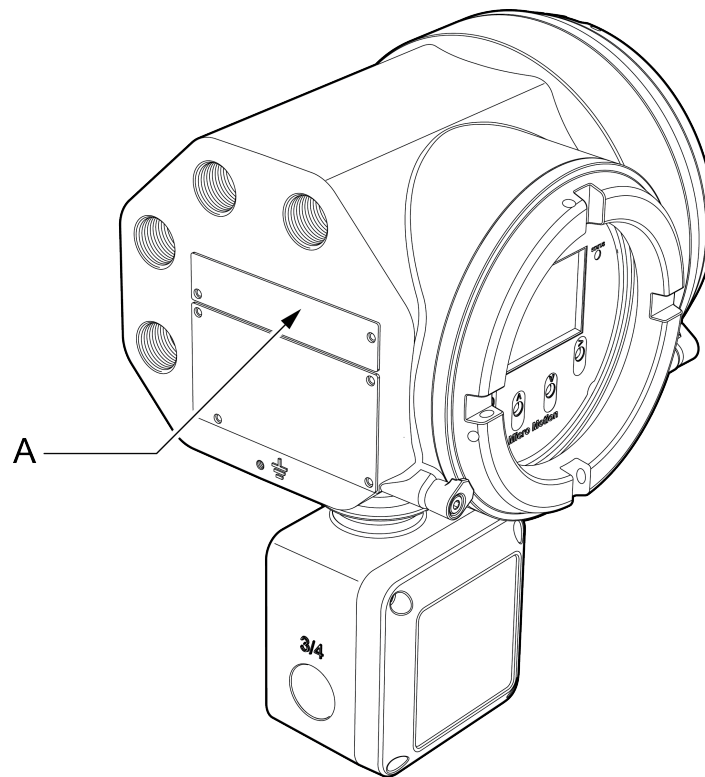
Certification of an essential part in a liquid measuring system

A designated and notified body uses the *Welmec 8.8 Guide on the General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring Instrument* to test and assess an essential part to be used in an MID liquid measuring system. When in compliance, the designated and notified body issues an Evaluation Certificate or a Parts Certificate.

The Model 5700 transmitter has been tested and assessed by the designated and notified body, NMI Certin BV in the Netherlands, in accordance with the Welmec 8.8 requirements. The Model 5700 has obtained Evaluation Certificate TC8519.

Table 2-1: Difference between Evaluation Certificate and Parts Certificate

Type of certificate	Description
An Evaluation Certificate	<p>A permission letter from the owner of the Evaluation Certificate is required when the Evaluation Certificate has to be mentioned in the MID EC/EU Type Examination Certificate.</p> <ul style="list-style-type: none"> • The Model 5700 transmitter has obtained Evaluation Certificate TC8519 issued by NMI Certin BV in the Netherlands. • TC8519 is owned by Emerson Process Management Flow BV in the Netherlands. • A permission letter is required from Emerson Process Management Flow BV in the Netherlands before TC8519 can be mentioned in an MID EC/EU Type Examination Certificate.
A Parts Certificate	<p>A permission letter from the owner of the Parts Certificate is not required.</p> <p>Example: The Rosemount temperature transmitter 3144P has Parts Certificate TC7458 issued by NMI Certin BV in the Netherlands; no permission letter is required from the owner, which is Emerson Process Management GmbH & Co OHG in Germany.</p>

Figure 2-1: MID label, liquid (option code OL)

A. Certificate number TC8519

Certification for fuel gas meters

The Model 5700 transmitter has been tested and assessed by the designated and notified body, NMi Certin BV in the Netherlands, as a gas meter for fuel gas applications in accordance with directive 2014/32/EU, Annex IV (MI-002). The Model 5700 has obtained an MID EC/EU Type Examination Certificate T10020.

The Model 5700 transmitter must be connected to an approved Micro Motion sensor as mentioned in T10020.

Figure 2-2: MID label, gas meter (option code OG)

Micro Motion, Inc. Boulder, Co. - USA	MASS FLOW SENSOR	MID CERTIFICATE No. T10020
Gas Type <input type="text"/>		Sensor Type <input type="text"/>
Qmax <input type="text"/>	Pressure Range <input type="text"/>	Sensor Serial No <input type="text"/>
Qmin <input type="text"/>	Ambient Temp. Range -40°C to 55°C	Year of Manufacture <input type="text"/>
Qt <input type="text"/>	Density Range <input type="text"/>	Class 1.0
Bi-directional use YES / NO		MMI-20009677 Rev.AA

3 MID flow computer

You can connect the Model 5700 transmitter to a flow computer for various applications, such as conversion calculations.

Approved flow computers

When using the Model 5700 transmitter in an MID application, you can connect the Model 5700 to an approved flow computer using the RS485 Modbus, and/or dual-pulse output, and/or 4-20 mA.

An example of flow computers that are approved for liquid measuring systems:

- A FloBoss S600 (TC7379, TC7470, TC8218)
- An OMNI 3000/6000 (TC7375)

An example of flow computers that are approved for gas meter systems:

- A FloBoss S600 (TC8219, T10152)
- An OMNI 3000/6000 (T10171)

Note

An approved flow computer is a flow computer that has either:

- An EC/EU-type examination certificate for annex MI-005 and/or MI-002
 - An Evaluation Certificate or Parts Certificate issued under the Welmec 8.8 guideline
-

4 MID power supply requirements

An Uninterruptible Power Supply (UPS) is mandatory if you are using uninterruptible applications, such as pipe-line applications or gas meter applications. In gas meter applications, the UPS must be sufficient to guarantee the safeguarding of all measurement functions for at least three days.

5 MID unsecured and secured modes

The meter is always either *secured* or *unsecured*. When the meter is secured, it means that the process data meets MID requirements for custody transfer applications.

For unsecured meters:

- The meter leaves the factory in unsecured mode with Status Alert A027: Security Breach active.
- Process data cannot be used for custody transfer until the meter is secured. The alert will clear after the meter is secured.
- All features and functions are available.

For secured meters, basic operator functions are available but configuration and calibration functions are not. See the following table.

Table 5-1: MID security and functions

Function	Meter is unsecured	Meter is secured
Meter configuration	✓	
Meter calibration	✓	
Sensor zero	✓	
Sensor simulation	✓	
mA output trim	✓	
Connecting to the device from ProLink III	✓	✓
Connecting to the device from the Field Communicator	✓	✓
Reading process data, configuration data, calibration, and diagnostic data	✓	✓
Viewing and acknowledging alarms	✓	✓

6 MID feature interactions

Process Variable approval

When administering Process Variables (PVs):

- Make sure that the Model 5700 transmitter is unsecured before administering PVs.
- Administer PVs using the procedures in the *Micro Motion Model 5700 Transmitters with Configurable Outputs Configuration and Use Manual*.

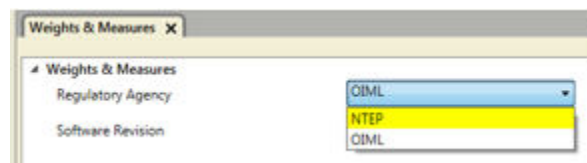
If PVs are already administered, the MID-approved PVs will display alternately with the banner `LEGAL FOR TRADE`. The PV's that are already administered can be seen from the transmitter display menu bar at Configuration > Weights & Measures > Approve Variables.

Totalizer and inventory behavior

The Model 5700 transmitter has seven totalizers and seven inventories. Each is independent and configurable—including flow direction. The PVs that are available for configuration depends on which licenses are installed. For details on configuration, see *Micro Motion Model 5700 Transmitters with Configurable Outputs Configuration and Use Manual*. You cannot configure totalizers or inventories when the Model 5700 is in custody transfer secured mode.

There are two custody transfer options:

- NTEP — not allowed for MID/OIML applications
- OIML



When in OIML mode:

- The decimal point position is fixed to the precision configured for the display variable. Totals and inventories always roll-over.
- When the maximum value for the configured display precision is reached, all the digits roll over to 0, but the decimal point does not move and the number of digits on the display does not increase. For example, the value 99999.999 rolls over to 00000.000.
- A rollover count is incremented for each total/inventory whenever they rollover. If the rollover count for a given total/inventory is greater than 0, a rollover indication is shown on the corresponding process variable screen. The roll-over indication is stored in non-volatile memory.
- Resetting a total (only possible when there is no flow) does not clear rollover count. Rollover of a Total or Inventory displays $R(x)$ — where x is the number of rollovers.

For example, R(3) means the value has rolled over three times. For rollover counts greater than 100, R (99+) is displayed.

See [Section 6.1](#).

Starting and stopping totals

Starting or stopping totals is not allowed. Totals/Inventories start incrementing automatically when the device is secured.

Total reset and total control method

Resetting one total resets all of the totals if the flow rate is zero. This includes frequency input total if the frequency input flow is zero. A display test is performed whenever totals are reset.

In gas meter applications, you might not be able to reset the totals since the total must be able to indicate the total of 8000 hours at maximum flow before rollover.

You can perform a total reset from the transmitter display, ProLink III, or the Field Communicator.

Figure 6-1: ProLink III totalizer control methods screen example



Inventory reset

Inventory reset is not allowed.

Display test

In custody transfer mode, the transmitter runs a display test after you reset the totals. When a display test runs, the following events occur:

1. All pixels go dark for 2 seconds.
2. All pixels light for 2 seconds.
3. The interface reverts to the previous screen.

Dual pulse output behavior

For a description of dual pulse output behavior, see the *Micro Motion Model 5700 Transmitters with Configurable Outputs Configuration and Use Manual*.

The allowable dual pulse mode settings for Weights and Measures are:

- 90° phase shift
- 180° phase shift
- quadrature

Documenting settings

The user or the manufacturer must record the following configuration parameters before using the device. See the *Micro Motion Model 5700 Transmitters with Configurable Outputs Configuration and Use Manual* for the procedures.

Table 6-1: Configuration parameters

Parameter	Value
Flow rate damping	
Sensor direction	
Mass flow rate unit	
Mass flow cutoff	
Mass flow rate meter factor	
Volume flow type	
Volume flow rate unit	
Volume flow cutoff	
Volume flow rate meter factor	
Density unit	
Density damping	
Density meter factor	
Density cutoff	
Temperature unit	
Temperature damping	
External temperature	
Pressure unit (gauge)	
Pressure flow factor	
Pressure density factor	
Pressure flow calibration pressure	
Totalizer and inventory sources (1-7)	
Totalizer and inventory directions (1-7)	
Is the totalizer reset on or off?	

Low flow cutoff settings

The low flow cutoff for mass flow or volume flow cannot be more than one-fifth of the minimum flow rate of the connected sensor.

Damping settings

Value	Maximum damping time
Flow	1,6 s
Density	1,6 s
Temperature	4,8 s

Last measured value fault time out settings

The maximum value for the “Last measured value fault time out setting” for mA and for pulses (one setting) is 2 s.

Meter factors in liquid measuring applications

The Model 5700 transmitter is equipped with meter factors for density and volume. You can use meter factors to adjust the density (or volume) in case the density (or volume) is outside the allowed limits, but is still within a band of two times the allowed limit. In MID/OIML terminology, this is called *Maximum Permissible Error MPE*. Using meter factors applies a linear shift in the measurement.

Units of measurement

System or meter	Allowed units of measurement
Liquid measuring system	<ul style="list-style-type: none"> • tons • kg • grams • respectively m3 or litres
Gas meter	<ul style="list-style-type: none"> • tons • kg • grams • Nm3 for pure gases or for gases with a known, fixed composition

6.1 Clearing rollovers

Prerequisites

The Model 5700 must be in unsecure mode.

Procedure

1. From the display, navigate to Operations > Totalizers > See Totals.
2. Select Total.
3. Select Clear Rollover.

7 Read revision and checksum data

Topics covered in this chapter:

- [Read revision and checksum data using the display](#)
- [Read revision and checksum data using ProLink III](#)
- [Read revision and checksum data using a Modbus Digital Communications host](#)

Use this section to verify that you have all the required software and firmware that are required to operate an MID-approved Model 5700 transmitter.

The approved software versions and checksums are listed in Evaluation certificate TC8519. The following Model 5700 transmitter software parts are essential for Weights and Measures compliance:

- Model 5700 transmitter software
- Internal or remote core processor software
- Transmitter display Peripheral Interface Controller (PIC) software
- PIC software
- Weights and Measures software

7.1 Read revision and checksum data using the display

You can use the transmitter display to verify that you have all the software and firmware required for MID approval.

Verify that the displayed values comply with what is listed in TC8519. It is not necessary to copy and save these values.

Procedure

1. From the transmitter display, verify the software.

Software	Path
Transmitter	Menu > About > Versions > Transmitter Software
Core processor	Menu > About > Versions > Core Software
LCD	Menu > About > Versions > LCD PIC Firmware
PIC firmware	Menu > About > Versions > PIC Firmware
Weights and Measures	Menu > About > Versions > W&M Application

2. From the transmitter display, verify the checksum information.

Software	Path
Transmitter checksum	Menu > Configuration > Weights and Measures > Transmitter Checksum
Core processor checksum	Menu > Configuration > Weights and Measures > Core Checksum
LCD PIC checksum	Menu > Configuration > Weights and Measures > LCD Checksum
PIC checksum	Menu > Configuration > Weights and Measures > PIC Checksum

7.2 Read revision and checksum data using ProLink III

Verify that the displayed values comply with what is listed in TC8519. It is not necessary to copy and save these values.

Procedure

- Using ProLink III, verify your software and firmware information by navigating to Device Tools > Device Information and verify the field values indicated in the following table.

Menu section	Field
Transmitter Electronics	Software Revision
	Firmware Checksum
Enhanced Core Processor	Software Revision
	Firmware Checksum
Display Processor	Software Revision
LCD PIC	Firmware Checksum
LOI PIC	Software Revision
	Firmware Checksum

- Verify your Weights and Measures version by navigating to Device Tools > Weights & Measures and verify the field values indicated in the following table.

Menu section	Field
Weights & Measures	Regulatory Agency
	Must be set to OIML.
	Software Revision

7.3 Read revision and checksum data using a Modbus Digital Communications host

You can use a Modbus Digital Communications host, (for example, a flow computer), to verify that you have all the software and firmware required for MID approval.

Verify that the displayed values comply with what is listed in TC8519. It is not necessary to copy and save these values.

Procedure

1. From a Modbus Digital Communications host, verify the following software.

Software	Reading register
Transmitter revision	0016
Core processor	1137 (16-bit Unsigned)
PIC	7133(16-bit Unsigned)
Button PIC	5538 (8-bit Unsigned)
Weights and Measures	1466 (16-bit Unsigned)

2. From a Modbus Digital Communications host, verify the checksum information.

Checksum software	Reading register
Transmitter	1517 (32-bit Unsigned)
Core processor	0315 (32-bit Unsigned)
PIC	7134 (16-bit Unsigned)
Button PIC	7132 (16-bit Unsigned)

8 Secure the meter

When the meter is secure, process data meets MID requirements for custody transfer applications.

Prerequisites

If necessary for your installation, arrange for a site visit by a certified Weights and Measures inspector, and ensure that the inspector is present for the appropriate portions of this procedure.

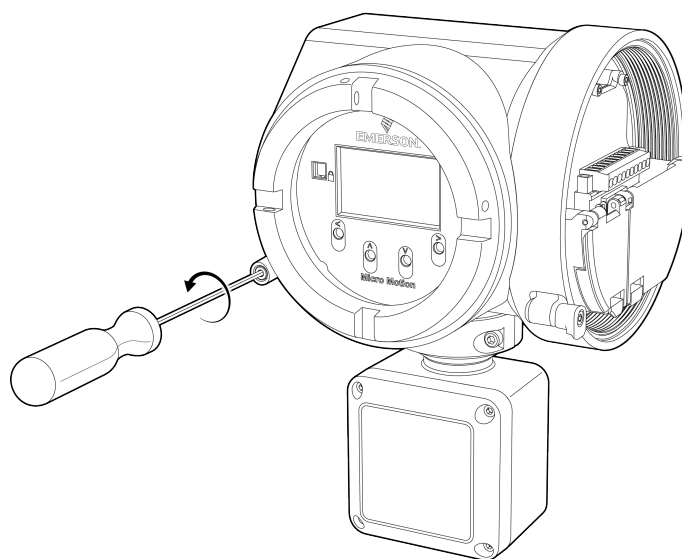
Ensure that the transmitter is ready to be secured, i.e., it is configured as desired and you have performed all appropriate tests and adjustments. After the transmitter is secured, you cannot make any changes to configuration, many maintenance actions are disallowed, and some operator actions are disallowed.

You will need a 3 mm hex driver and a 9.5 mm square shaft screw driver.

Procedure

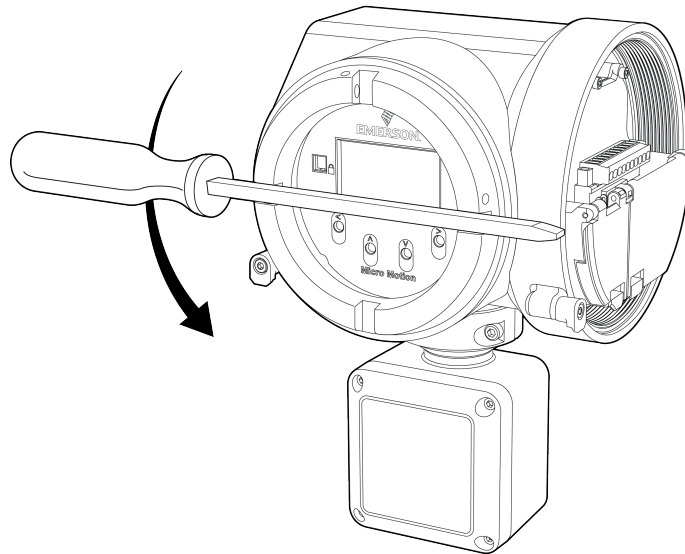
1. Power down the meter.
2. Remove the safety spacer and end-cap.
3. Remove the transmitter display locking device.

Example:



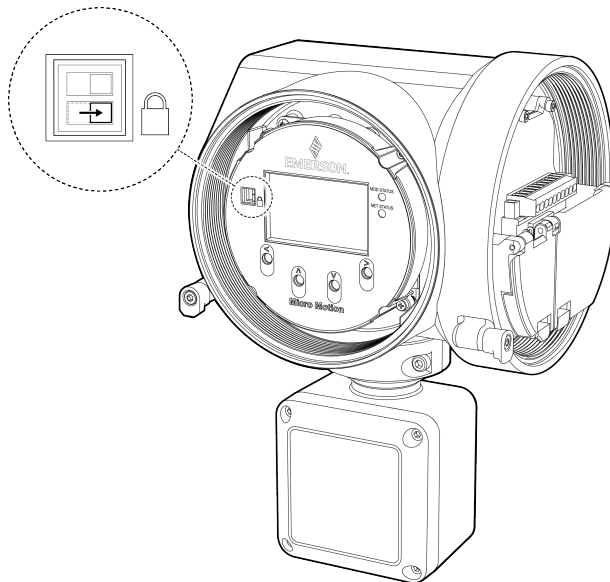
4. Remove the transmitter display cover.

Example:



5. Move the custody transfer switch to the locked position (to the right).
The custody transfer switch is on the bottom.

Example:



6. Re-install the display cover and locking device.
7. Install the required physical seals.

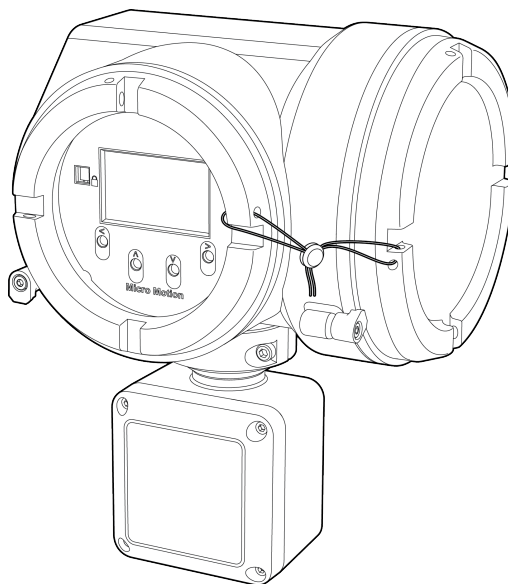
Important

- For a Model 5700 transmitter that is integrally-mounted on the sensor, seal the transmitter to prevent it from being removed from the measurement sensor. Do this by

either physically sealing the transmitter to the sensor, or by writing the sensor's serial number on the transmitter's type plate.

- For a Model 5700 transmitter that is remotely-mounted from the sensor, see the sealing instructions in Evaluation Certificate TC8519.

Figure 8-1: Custody transfer seal



8. Power up the meter.

During power-up, the meter checks the position of the custody transfer switch, and clears Status Alert A027: Security Breach Active.

9 Switch to unsecured mode

If the meter is secured, you must switch to unsecured mode to change the transmitter configuration or perform administrative tasks.

Prerequisites

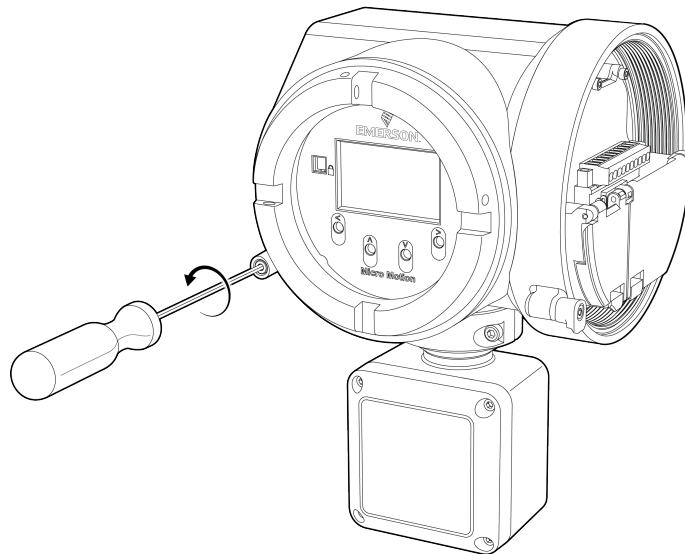
Before switching to unsecured mode, ensure that you will be able to switch back to secured mode. Because switching to unsecured mode requires breaking the physical seal, switching back to secured mode may require a site visit from a certified Weights and Measures inspector and reinstallation of the physical seal.

You will need a 3 mm hex driver and a 9.5 mm square shaft screw driver.

Procedure

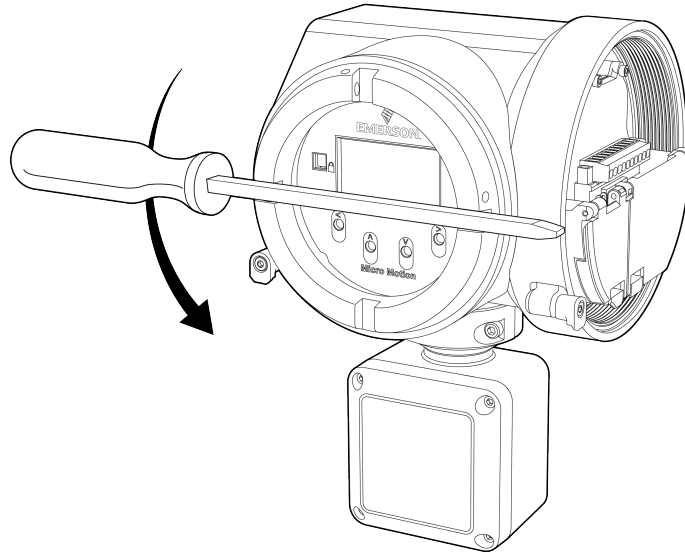
1. Power down the meter.
2. Remove the physical seals.
3. Remove the transmitter display locking device.

Example:



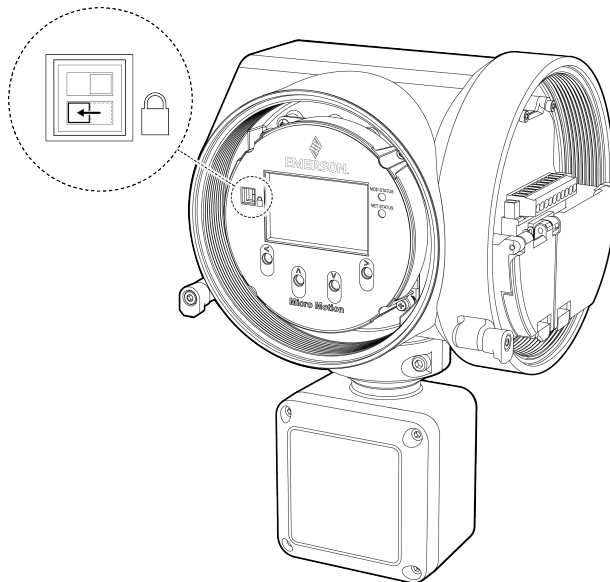
4. Remove the transmitter display cover.

Example:



5. Move the custody transfer switch to the unlock position (to the left).
The custody transfer switch is on the bottom.

Example:



6. Re-install the display cover and locking device.
7. Power up the meter.

During power-up, the meter checks the position of the custody transfer switch, and posts Status Alert A027: Security Breach Active.



MMI-20032388

Rev AA

2016

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